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SOME NOTES ON THE POTATO SITUATION IN GREAT BRITAIN

H. BRYAN

National Institute of Agricultural Botany, England

A paper by Hugh B. Tabb in Volume XII, No. 1, of the American Potato Journal on the "National Regulation of the Potato Industry" suggests to the writer that the potato growers of the United States might care to know what action has been taken to regulate and standardize the potato industry of Great Britain.

From the point of view of size it may seem idle to compare the condition of so vast a country as the United States with so relatively small a country as Great Britain, but it would appear from the article referred to that the potato position in the two countries is very similar. In both countries potato growing has not been a paying proposition for the last three years and in both cases a surplus of potatoes automatically causes a drop in price out of all proportion to the amount of surplus. For instance, in 1932 an increase of production of 9 per cent in Great Britain caused a drop in price of 26 per cent; on the other hand a drop in production of 23 per cent in 1931 caused a rise of 53 per cent in price. It is clear that the demand for potatoes is inelastic and that there is a more or less well-defined tonnage which can be grown at an economic price but to exceed this will court disaster for the growers.

In an attempt to regulate and organize the potato industry in Great Britain, a Potato Marketing Scheme has recently come into force. This Scheme was drawn up by potato producers themselves and approved by vote of the necessary majority of growers with more than one acre of potatoes—and having passed both Houses of Parliament, by virtue of the Agricultural Marketing Acts of 1931 and 1933, duly became law.

Its main objects are to prevent over-production in Great Britain itself and to limit imports from foreign countries. The limitation of imports has already been achieved but the question of over-production still remains to be solved. The Scheme which became operative in March, 1934 is administered by a Board consisting of approximately 30 growers (elected by vote) representing all the potato growing districts. In brief, all growers of more than one acre must register with the Board and may only dispose of their produce through merchants duly authorized by the Board. If a grower does not register then he may not sell his potatoes for human consumption.

The maximum acreage of potatoes allowed each grower is known as his basic acreage and may be either that grown by him in 1933 or the average for the three preceding years. For each acre grown he pays a levy of 5/- (\$1.25) to the Board. If a grower desires to increase his basic acreage he must pay a levy of £5 (\$20) for each additional acre.

The Scheme is not a trading but a regulatory scheme. In times of glut the Board may impose the use of certain screens and forbid the sale for human consumption of those potatoes which are smaller than the prescribed size. The Board has no powers to fix prices or limit acreage other than as above shown. Seed potatoes are not affected by the Scheme.

The Scheme bristles with difficulties, the main one being that the Board has to deal with about 75,000 growers, approximately 60% of whom grow less than 5 acres each, though it is true these figures do not seem very formidable when compared with those given in Hugh B. Tabb's article, where it is estimated that there are 954,000 growers of more than one acre in the United States. To organize and influence thousands of independent and conservative growers is naturally an arduous task and some time must elapse before the effects of the Scheme are felt. It is clear that some sort of compulsion must be available and the Board has the necessary powers to inflict penalties in cases where its regulations are not carried out.

The mere fact that the Scheme is the growers' own conception and is entirely financed by them, has a markedly steadying effect on the individual farmer and so far proceedings taken for non-compliance with the regulations have been entirely negligible.

The Board has accumulated a large amount of essential data during the past year which must have a direct bearing on its policy for the coming season. It is too soon to form an idea of the ultimate outcome of the Scheme but it is at least a firm foundation

on which, with the good-will of the growers, a more prosperous industry may be built.

Perhaps the results of research work on the potato during the last decade are not unconnected with over-production. The work on virous diseases and the production of virous-free seed—knowledge eagerly seized upon by the commercial producer of seed potatoes—with consequent heavier yields may be a contributory cause. Other causes may be the use of new and heavier cropping varieties combined with the increasing and intelligent use of artificial manures. In any case progress cannot cease and the potato industries in the different countries must adapt themselves to changed conditions.

The main source of the seed potato supply for Great Britain is its northern portion—Scotland. Crops are examined while growing, by Inspectors of the Department of Agriculture of Scotland with a view to the issue of certificates in respect of purity and freedom from disease. Stock seed certificates are issued in respect of crops which are 99.95 per cent pure and true to type, contain no varietal mixture, bolters or leafroll and not more than one plant with severe mosaic and twenty with mild mosaic (or none with severe mosaic and twenty-five with mild mosaic) per acre and not more than 1 per cent of blackleg at the second inspection. No crop will be rejected on account of faint mottling. The tubers on examination must be sound and free from serious diseases (excluding Pit Rot and Blight). No crop is considered as suitable for a stock seed report unless it is at least 20 yards from the nearest potato crop not attaining the Department's health certificate standard. Health certificates are granted to growing crops which contain not more than 3 per cent combined of leaf roll, severe mosaic and varietal mixture; in addition the crop must not be less than 99.5 per cent true to type.

Certificates are also issued to crops not attaining the standards set out above but no certificate or grade is issued in respect of crops that contain more than 10 per cent of the diseases referred to.

In England and Wales the majority of potato growers obtain fresh seed every other year from Scotland, but attempts to produce their own seed are now being made by growers in certain districts of England. The method followed is to isolate the plots intended for seed production at least 70 yards from growing potatoes which might serve as a source of virous infection. It is found by careful inspection and early roguing for virous-infected plants that stocks may be kept relatively virous-free over a number of years.

METHODS AND TRENDS IN 400 BUSHEL POTATO
PRODUCTION IN PENNSYLVANIA

J. B. R. DICKEY

*Extension Agronomist, Agricultural Experiment Station, State
College, Pa.*

Pennsylvania's 400 Bushel Club was started in 1922 by E. L. Nixon, who was then Extension Plant Pathologist at State College. The idea was to give a definite form of recognition to our most successful potato growers. Starting with a few in the earlier years, the annual numbers increased to nearly 400 in 1928. Since that year yields have been checked only for those not already members of the club, unless an old member expected to make a much larger yield than his previous record. We have now at least 1000 growers in the state who at some time have qualified. Several hundred of these have produced over 500 bushels per acre, and 15 or 20 over 600 bushels. At least three growers have made over 400 bushels for five consecutive years. The highest officially checked yield was 696 bushels, made in 1928 in Chester Co. A yield of approximately 700 bushels was reported on the State Penitentiary Farm in Centre County this year, but unfortunately was not checked in the regular manner. Yields are checked by County Agents according to definite rules requiring that at least four representative rows, and at least 10 per cent of the acre shall be dug and the potatoes weighed.

My interest, as extension agronomist, in the Club has been more particularly in *how* these yields were secured. We have tried to have *each* grower who qualified fill out a questionnaire, with the help of the County Agent, giving all available information on all the important operations. These data have been tabulated every year and have shown that the majority practiced methods which we believe are good. The tabulated data were of great interest and value in addressing potato growers' meetings. Farmers are always much more interested in large crops, and in how they are grown, than in theories or the results of experiments. Most of them learn better methods by copying those of more successful neighbors. It is, however, seldom safe or satisfactory to follow blindly the practices of a single grower, no matter how successful he may be. He may have special conditions which make his methods inapplicable to most, and which may have made it possible for him to succeed in spite of, rather than because of, some of the things, which he did. If we average the methods of 100 or more successful growers, however, we get a fairly clear picture of methods

which are apt to lead to success under an average set of conditions. We have then, the strongest kind of argument, with farmers for the adoption of these methods.

In the earlier years during which these data were collected the methods reported varied much more widely than in the more recent years. As our potato growers became more familiar with approved methods they have standardized their practices to a certain extent, though still by no means to the extent that standardization has been developed in Maine, Long Island and New Jersey. It is my belief that the publicity given the methods of the 400 bushel growers has been a large factor in this standardization and in the general adoption of better methods.

A study of the data from year to year seems to show very definite trends. These may go in one direction for a time until the growers apparently decide they have gone far enough, or even too far. In the latter case a backward swing follows, which comes to rest at what is very probably the most practicable point. Practices may come rapidly into popularity, and then as rapidly be abandoned as the growers decide they are not the most desirable, or are not worth the trouble they involve.

Just because a high percentage of our most successful growers follow a certain practice (as for instance the use of a definite amount of a certain fertilizer ratio), does not prove conclusively that it is most economical for all, or even for the majority. There is still plenty of room for experimental work, and most practices must be adapted to soils and seasonal conditions. Pennsylvania conditions are so varied that here in particular no hard and fast rules can be expected to relieve the grower of the necessity of using all the brains and judgment he may possess. Where a high percentage of our most successful growers follow certain practices, however, and continue to do so, there are probably good sound reasons back of them.

While there were many attempts to make record yields through very intensive methods of manuring, fertilization, close planting, etc., these were usually disappointing. The average methods used, it will be noted, were neither very expensive nor intensive, but simply *good* methods which any farmer could practice. The success of the 400 bushel growers seems to have been primarily due, not to any *one* thing which they did, but rather to their doing a number of essential things *thoroughly* and with good judgment. High yields have been made in about equal number by potato specialists, growing considerable acre-

ages, and by general farmers who grew only enough acres to assure the potatoes proper attention and care.

An examination of the data shows that the percentage growing Russets is high, and increased generally until 1934 when there were a larger number reporting from Somerset County where white Rurals are more generally grown. Nearly every year we have had a few 400 bushel crops of Cobblers and usually a few of Green Mountains. The percentage securing their seed directly from Michigan was high until 1934, when it was somewhat reduced, with an increase in the percentage using seed one year removed from Michigan certified. This indicated the prevalence of the practice of using one year removed seed, especially in years like 1934 when certified seed was relatively high in price. As many as 20% in some years reported planting seconds, either from certified or one year removed seed. Practically all our qualifying yields were grown from what might be termed improved seed, not over a few years removed from certification.

The average amount of seed planted has shown a gradual increase from 17.6 bushels in 1923 to 26 bushels in 1929. The reduction in 1934 is due to high-priced seed, a less intensive group of growers and wider spacing. The closer spacing of rows and hills, which changed from 34" by 12" in 1923 to 30½" by 9½" in 1929 has played an important part in increasing yields and in cutting down oversize. It is one of the reasons for the increase in the amount of seed required, though larger seed pieces have also been partly responsible. Since 1929 there has apparently been a tendency toward somewhat wider spacing, as the farmer came to realize the difficulty of handling extremely close rows. Thirty-two inch rows have come to be nearly a standard width with our commercial growers.

The percentage growing potatoes after some legume crop has increased from 77 per cent in '23 to over 90 per cent in recent years. Red clover, mown one year for hay, represents about 50 per cent, but alfalfa is also very commonly used. Sweet clover, used more generally by the potato specialists in a two-year rotation, increased rapidly to 28 per cent in 1929 and is holding at 20 to 25 per cent. Soy beans plowed down amounted to 7.7 per cent in '29 and has since almost passed out the picture, as growers realized that their place was largely confined to soils where clovers could not be grown. Twenty years ago our potatoes were grown almost entirely on corn stubble in the southern counties and on old timothy sods in the north. Neither have ever shown a high percentage in the 400 bushel club and that percentage has been growing smaller.

Twenty-three per cent of the club members in 1928 plowed a sod in

the fall and then reseeded in the spring but since then this practice has been falling back in popularity, partly due to more trouble with weeds on doubly plowed land. Most of our plowing is done in the spring. For a time some club members used special deep tillage tools in preparing a seed bed, but the percentage was never high and has become smaller, indicating its questionable value on normal soils.

While we have had as many as 25 per cent in one year produce 400 bushels without manure, the percentage has usually been lower. There seems to have been less dependence on manure in recent years as rotations have improved and the value and use of legumes have been better understood. The average application of manure has been about ten tons per acre and in at least 75 per cent of the cases the manure has been applied before mid-winter.

The average number of row cultivations has decreased from 5.3 in 1923 to 2.8 in recent years. Growers are coming to a better realization of the theory of cultivation, and its possible dangers, and are making much greater use of the harrow before emergence and of the weeder to supplement later cultivation. The percentage using a weeder has risen to approximately 90 per cent.

Spraying has been an important factor in securing high yields. Only three 400 bushel crops are reported without either spraying or dusting, and until the past year very few succeeded with dust. The average number of spray applications has risen from seven in '23 to 12.5 in '29. Fewer applications were made in 1934, but this does not reflect a recessive trend so much as less weather requiring extra applications, and a less intensive group of growers.

The average amount of fertilizer applied was increased each year until 1928 when there was a tendency downward. This was very marked in 1934 when the price of fertilizer was high and credit scarce. Part of the downward tendency has been caused by the gradual abandonment of broadcast applications in addition to the fertilizer used in the row. This is clearly shown in the averages by years, as is also the trend away from broadcast applications of all fertilizer, and from the exclusive use of superphosphate. The most common fertilizer ratio in recent years has been a 4-8-7, which was used in at least 80 per cent of the recent 400 bushel crops.

In closing it might be stated that nearly every county and every soil type in the state has produced 400 bushel crops of potatoes. This seems to indicate that there is not so much to so-called "potato soils" and "potato sections" as some of us used to think. Good judgment, good methods and reasonably favorable weather will apparently produce a very satisfactory yield on any reasonably fertile, well-drained soil.

THE COMPARATIVE VALUE OF CALCIUM CYANAMID AND AMMONIUM SULPHATE ON THE YIELD OF IRISH POTATOES ON BLADEN FINE SAND

HOYT SHERARD*

Univ. of Florida, Gainesville, Fla.

The object of the investigation reported herewith was to study the effects of time, rate and method of application of calcium cyanamid in comparison with ammonium sulphate upon the yield of potatoes on Bladen Fine Sand and also the influence of these materials on the pH value and exchangeable calcium of the soil.

The calcium cyanamid used in the study contained 22% nitrogen and calcium equivalent to 70% hydrated lime. The pulverized material was used for the first crop while the granular product was used for the second and third crops.

The study was conducted during the 1932, 1933 and 1934 crop years on two uniform fields in the vicinity of Hastings, Florida. Each field was divided into 1/40th acre plots and the different fertilizer treatments were replicated five times. The fertilizers were applied by hand about two weeks before planting (except part of the cyanamid) using the customary rates of phosphoric acid and potash per acre. The calcium cyanamid was applied at six, four and two week intervals before planting in combination with various mixtures of ammonium sulphate, both with ammonium phosphate and superphosphate. Some of the mixtures with the ammonium phosphate received supplements of gypsum and dolomite. With the exception of calcium cyanamid, which was allowed to remain on the surface four weeks before mixing, all the fertilizers were mixed with the soil immediately following application. All the farm practices were uniform, allowing the potatoes to grow to maturity. The harvested results of marketable potatoes are given in table 1.

The data in table 1 show that the mixtures of calcium cyanamid and ammonium phosphate gave, on the average, greater yields than did the mixtures of calcium cyanamid, ammonium sulphate and superphosphate. The gypsum and dolomite seemed to have very little influence on the yield. This is perhaps due to the accumulation of calcium in the soil as a result of previous fertilizer practice. The different dates of applying

*The writer wishes to take this opportunity to express his appreciation to Dr. O. C. Bryan for the helpful suggestions and criticisms rendered during the experimental work and preparation of the manuscript.

TABLE 1—The influence of time, rate and method of application of Calcium Cyanamid on Bladen Fine Sand on the yield of potatoes.

Treatment	Acres Applications of Fertilizer Materials(a)			Gypsum or Dolomite	Average Acre Yield of Marketable Potatoes (No. I's and II's)			Exchangeable Calcium* and Reaction of Soil at Different Depths in Inches			
	Calcium(b) Cyanamid	Ammonium Phosphate			1932 Bus.	1933 Bus.	1934 Bus.	0-8"		8"-16"	
		Lbs.	Lbs.					Ca.	pH	Ca.	pH
1	369 (6)	300	...	...	91	217	212	...	...	...	...
2	246 (6)	300	300	...	88	217	210	...	...	...	...
3	246 (6)	300	...	...	80	234	199	...	...	...	...
4	369 (4)	300	...	...	87	218	215	...	...	...	...
5	246 (4)	300	300	...	79	216	200	...	...	...	...
6	246 (4)	300	...	...	88	204	199	...	...	...	...
7	369 (2)	300	...	...	75	212	194	...	5.09	9.2	4.7
8	246 (2)	300	300	...	96	218	195	...	4.58	7.8	4.7
9	246 (2)	300	...	...	85	211	198	...	4.70	7.0	4.6
10	246 (2)	300	250(c)	Ammonium Sulphate	76	205	199	...	4.90	6.8	4.7
11	164 (2)	300	88	...	72	198	184	...	...	...	...
12	82 (2)	300	176	...	82	198	176	...	...	...	...
13	0 (2)	300	264	...	84	196	165	...	...	...	...
14	450 (6)(d)	Super-phosphate 900	73	...	90	211	204	...	...	...	...
15	450 (6)	900	73	...	91	223	206	...	...	...	...
16	314 (2)	900	88	...	83	198	193	...	4.7	7.5	4.6
17	232 (2)	900	176	...	82	211	183	...	4.8	5.7	4.5
18	150 (2)	900	264	...	77	201	175	...	4.7	4.9	4.5
19	0 (2)	900	424	...	89	198	162	...	4.2	4.7	4.6

(a) All plots received 216 pounds of muriate of potash per acre which, with the nitrogen and phosphoric acid applied, was equivalent to 1800 pounds of a 5-8-6 mixture per acre.

(b) (6), (4), and (2) indicate the time interval, in weeks, between the application of the Calcium Cyanamid and the planting of the potatoes.

(c) Dolomite was used instead of gypsum.

(d) Calcium Cyanamid was allowed to remain on the surface for 4 weeks before mixing with soil.

* Milli-equivalent of calcium per 100 grams of soil.

the calcium cyanamid had no significant influence on yield, but the higher rates appeared to give somewhat higher yields when applied four and six weeks before planting. This, however, was not consistent. The decrease in calcium cyanamid with a corresponding increase in ammonium sulphate, decreased the yields of potatoes.

GREENHOUSE STUDIES

Greenhouse studies were conducted on a similar soil type, Bladen Fine Sand, secured from the surface six-inch layer of a virgin soil in the Hastings area. The soil was mixed and placed in two-gallon glazed earthenware jars. The fertilizer treatments and the method of application in the greenhouse duplicated the field treatments, with the exception that the rate of application was doubled for each crop and the fertilizers were thoroughly mixed with the entire volume of soil. The cultures were grown under optimum moisture conditions in triplicate and during the regular potato growing season. In order to duplicate the regular farming crop rotation, a cover crop was grown following each crop of potatoes without additional fertilizers. The yield of potatoes and of cover crops are recorded in table 2.

RESULTS

Where the calcium cyanamid was applied at the rate of 738 pounds per acre and mixed with moist soil, six, four and two weeks in advance of planting, the yield decreased slightly with a decrease in time interval between applying fertilizer and planting. Both dolomite and gypsum increased the yield, as is shown in table 2, when used with 492 pounds of calcium cyanamid per acre. Applications of calcium cyanamid at the rate of 900 pounds per acre and mixed with the soil six weeks before planting, gave slightly higher yields than when the material was allowed to remain on the surface of the soil four weeks without mixing.

Mixtures of superphosphate and ammonium sulphate gave no better yields than did those carrying phosphoric acid as ammonium phosphate. But the yields decreased as the calcium cyanamid decreased in the ammonium sulphate mixture, as brought out in tables 1 and 2.

The cover crop growth was correlated with the yield of potatoes and the pH of the soil. Following the use of the larger amounts of calcium cyanamid, considerably higher yields of sorghum were secured, which indicates that the calcium cyanamid had a beneficial residual effect. In contrast, the cover crop yields were decreased as the

TABLE 2.—*Influence of time and rate of application of Calcium Cyanamid on Bladen Fine Sand under greenhouse conditions upon the yield of potatoes and cover crops and on the pH and the Calcium content of the soil.*

Culture No.	Acre Applications of Fertilizer					Yield of Potatoes		Average	Yield of Cover Crop		Average	pH	Exchangeable Calcium
	Materials(a)			Gypsum or Dolomite		Gms.	Gms.	Gms.	Gms.				
	Calcium Cyanamid	Ammonium Phosphate	Lbs.	Lbs.	1933					1934			
1	738 (6)	600	...	...	118	144	137	18.4	16.1	5.42	6.49
2	492 (6)	600	600	...	133	157	10.2	11.2	10.7	4.80	6.72		
3	492 (6)	600	...	...	127	132	12.2	10.7	11.4	5.00	5.87
4	738 (4)	600	600	...	113	145	14.9	16.8	15.8	5.36	6.10		
5	492 (4)	600	600	...	130	163	9.0	12.5	10.7	4.80	6.32		
6	492 (4)	600	...	...	124	137	8.3	16.9	12.6	5.14	5.89
7	738 (2)	600	600	...	98	152	10.1	15.9	13.0	5.38	6.15		
8	492 (2)	600	600	...	135	138	6.7	11.5	9.1	4.75	6.70		
9	492 (2)	600	...	...	82	159	6.8	13.6	10.2	5.14	5.86
10	492 (2)	...	500(c)	Ammonium Sulphate	118	177	10.7	12.7	11.3	5.50	6.35		
11	338 (2)	600	176	...	104	110	5.8	8.3	7.1	4.88	5.42		
12	164 (2)	600	352	...	90	48	5.5	0.7	3.1	4.38	5.29		
13	... ..	600	528	...	52	34	5.4	0.0	2.7	4.05	5.19	
14	900 (6)*	1800	146	Super-phosphate	145	150	12.5	8.8	10.7	5.00	6.32		
15	900 (6)	1800	146	...	164	151	14.1	9.8	11.9	5.15	6.23		
16	628 (2)	1800	176	...	137	150	10.8	7.3	9.0	4.83	6.25		
17	462 (2)	1800	352	...	118	157	10.0	7.0	8.3	4.46	5.94		
18	300 (2)	1800	528	...	101	77	4.6	3.7	4.2	4.22	5.65		
19	... ..	1800	848	...	56	20	1.7	0.0	.8	4.07	5.29	
20	Check—No fertilizer	...	...	...	29	60	2.4	5.9	4.1	4.83	5.06

(a) All plots received 432 pounds of muriate of potash per acre which, with the nitrogen and phosphoric acid applied, was equivalent to 3600 pounds of 5-8-6 mixture per acre for the standard rate.

(b) (6), (4) and (2) indicate the time interval, in weeks, between the application of the calcium cyanamid and the planting of the potatoes.

(c) Dolomite was used instead of gypsum.

(d) Milli-equivalents of calcium per 1,000 grams of soil.

* Calcium Cyanamid allowed to remain on the surface for four weeks before being mixed with the soil.

application of ammonium sulphate was increased. This was probably due to excessive acidity.

Laboratory studies were made on soil samples secured from both the field and the greenhouse. A direct correlation was found to exist between the amount of exchangeable calcium in the soil and the yield of potatoes on plots receiving various mixtures of calcium cyanamid and ammonium sulphate. The pH value of the soil increased as the application of calcium cyanamid increased, and decreased in proportion to the amount of ammonium sulphate used.

SUMMARY

1. Calcium cyanamid produced no injurious effects on potatoes when mixed with the soil two, four and six weeks before planting, even when applied at the rate of 492 pounds per acre. An application of 900 lbs. per acre produced no injury under greenhouse conditions.
2. Calcium cyanamid produced better yields of potatoes (20 bushels per acre) than did equal amounts of ammonia from ammonium sulphate. Moreover mixtures of calcium cyanamid and ammonium phosphate gave better yields than did mixtures of calcium cyanamid, sulphate of ammonia and superphosphate.
3. Dolomite and gypsum used in conjunction with ammonium phosphate mixtures increased the yield of potatoes with virgin soil under greenhouse conditions, but had little or no effect on the yield in fields which had previously been fertilized.
4. An increase in calcium cyanamid increased the yield of potatoes, also the pH value and replaceable calcium in the soil, while an increase in ammonium sulphate decreased the yields, pH values and replaceable calcium.

REPORT OF RESEARCH COMMITTEE ON POTATO
BREEDING

C. F. CLARK

Associate Horticulturist, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C.

This report is intended to comprise a survey and summary of the work relating to potato breeding which has been accomplished by American and foreign investigators during the year 1934 and the latter part of the preceding year.

The field of potato breeding has been covered so thoroughly by Plant Breeding Abstracts of the Imperial Bureau of Plant Genetics, Cambridge, England, that, with one exception, abstracts of all the papers to which reference is made in this report have been published in that periodical and it is from that source that material for the greater part of this report has been drawn. The lines of work which have formed the basis for these papers comprise a wide range of subjects covering nearly all phases of potato breeding.

New varieties.—Krantz and Tolaas (8) report the introduction of a new early maturing variety, Warba, by the Minnesota Experiment Station.

In a paper by Stevenson and Clark (16) the chief characteristics of three new varieties, Katahdin, Chippewa and Golden, introduced by the U. S. Department of Agriculture, are given.

Aamisepp (1) reports the production of two new varieties, Kalev and Kungla, at the Plant Breeding Station at Jõgeva, Estonia. In extensive tests these varieties outyielded two commonly grown commercial varieties. Both are resistant to wart disease.

Pollen studies and fruit setting.—In a study of the pollen of a large number of potato varieties Rathlef (10) found that the majority of varieties in the temperate zones are pollen fertile to only a slight degree and that the quality of pollen is influenced by various climatic and biological factors. A group of cultivated potatoes from the high Andes was found to have pollen of better quality than the most fertile varieties of the temperate zones.

Semsroth (15) found that the best climatic conditions for the setting of fruit are a low daily average temperature (about 65°F.) with a low average maximum temperature (about 72°F.). A bad set results from a high average daily temperature (about 70°F.), a very low minimum and a high maximum, a relatively low air humidity and heavy showers on the day of emasculation and pollination.

South American varieties as a source of breeding material.—In

three papers by Bukasov (3), (4), and (5), entitled respectively, "The Potatoes of South America and Their Breeding Possibilities," "Revolution in the Breeding of the Potato," and "The Great Crisis in Potato Breeding," descriptions are given of the material collected by the Soviet expeditions to South America.

Cytological studies of the great wealth of forms whose distribution embraces Mexico, Central America and South America, showed the presence of all members of the polyploid series of somatic chromosome numbers, viz., 24, 36, 48, 60, and 72.

Several of the species were found to possess characteristics which are of special interest to the potato breeder, such as resistance to late blight, to virous diseases and to wart, also frost resistance, early maturity, short rest period and tolerance to tropical conditions.

The author concludes that there are two main centers of origin of cultivated potatoes, viz., the Chilean Coast and Island of Chiloe, which together are considered the original source of the cultivated European potato, and the high Andes region which contains a great variety of forms.

Genetic studies.—Three papers have appeared which have been devoted chiefly to genetic studies of the potato. In a study of inheritance of flesh color, Rathlef (11) found that segregations for that character in progenies obtained by crossing Richter's Jubel with three Peruvian varieties indicate that more than one factor must be assumed to account for yellow flesh, also one factor for the undesirable grayish-green that occurs in *Solanum tuberosum*. An additional yellow factor must also be concerned in the production of the intense yellow flesh of certain South American varieties.

From the behavior of progenies of another series of crosses between Richter's Jubel and Peruvian varieties, Rathlef and Siebeneick (12) concluded that although a factorial basis could not be established for tuber shape and depth of eye intermediate inheritance of shape was evident, while seedlings with shallow eyes formed the smallest group in each cross.

Studies of the mode of inheritance of resistance to wart disease have been reported by Lunden and Jorstad (9). The results obtained from an extensive series of crosses were explained by assuming that two complementary factors, Y and Z, are able to produce immunity when both are present, even in a heterozygous condition. These factors are supposed to be independent of a dominant factor, X', which induces immunity independent of any other factor, and another dominant immunity factor, X'', which is similar to, or identical in its nature with X'.

Interspecies crosses.—Extensive hybridization experiments have been conducted by Kovalenko and Sidorov (6) the results of which are reported in a paper entitled "Inter-species Hybridization of the Potato." A summary is given below which is based on the breeding behavior of a large number of species grouped according to their chromosome numbers.

The hexaploid species *Solanum demissum* crosses fairly readily with *S. andigenum* and *S. tuberosum* when used as a seed parent but not when used as a pollen parent. The pentaploids behaved similarly though not quite so successfully. Some of the tetraploid species functioned best as pollen parents, others as seed parents. Crosses between triploid species generally resulted in failure. The diploid species crossed very successfully with each other and to a certain extent with the tetraploid and hexaploid species.

Frost resistance.—Resistance to frost injury is receiving considerable attention, particularly in Germany and Russia. The work reported includes chiefly studies of the behavior of South American varieties as well as of progenies resulting from hybridization. Schick (13) found that *Solanum acaule* would withstand a temperature of about 23.0°F. and *S. demissum*, *S. ajanhuiri* and *S. curtilobum* about 26.6°F. Vesselovskii (17) considers *S. acaule* to be the most frost-resistant species, with *S. demissum*, *S. curtilobum*, *S. semidemissum*, *S. ajanhuiri* and forms of *S. andigenum* next in the order given. Hybrids were obtained which would withstand a temperature of about 27.9°F.

Disease resistance.—At most of the institutions where a very extensive potato breeding program is in operation much of the work centers around the breeding for resistance to some of the important economic diseases, those receiving the most attention being late blight, scab, wart and the virous diseases.

Of the three papers which have reported the results of work on disease resistance two deal with resistance to late blight and one with resistance to scab.

Schmidt (14) found that strains of Müller's hybrids which had apparently been resistant to *Phytophthora* in previous tests suddenly succumbed to an attack of this organism in 1932. This was considered to be due to the presence of a new physiological strain of the attacking organism. In progenies derived from crosses between cultivated varieties and *Solanum antipovichi*, *S. ajuscoense*, *S. demissum* and *S. verrucosum* some of the seedlings were found to be susceptible to the new strain of *Phytophthora*, while others were resistant.

Kovalev (7) reports that he obtained seedlings resistant to late blight from crosses between *Solanum demissum* and the variety Alma

and between *S. demissum* and *Nobelia*. Hybrids of the cultivated potato of the Andes, *S. andigenum*, were also found to be resistant.

Berkner (2) points out that the ultimate method of controlling scab is by means of resistant varieties. Extensive studies showed that Jubel is one of the most highly resistant of the many varieties tested. That resistance to scab is transmitted by this variety is indicated by the frequency with which Jubel occurs in the ancestry of scab resistant varieties.

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THE PRICE SITUATION

The following report was released on April 15 by the Bureau of Agricultural Economics of the United States Department of Agriculture: Potato prices at market centers declined slightly during the first 3 weeks of March but rose sharply during the first week of April. The recent advance more than offset the earlier decline in March and now prices in nearly all markets are averaging above those of a month ago. Much of this change in the market situation may be attributed directly to the scarcity of southern early potatoes, to the recent sharp price-advances of other vegetables such as onions and cabbage, and to the slight improvement in general demand conditions. Present prospects indicate that the supplies of new potatoes will be relatively short this season until the North Carolina crop begins to move to market in June. The March 1 intentions-report indicates that the 37 late and intermediate potato states probably will have about the same acreage for harvest in 1935 as in 1934 which, if average yields are obtained, would indicate a total United States crop of 357,000,000 bushels or only slightly more than an average crop.

Recent reports indicate that the first section of the southern early group of states (Florida and Texas lower Valley) will harvest only 2,852,000 bushels of potatoes this season or 27 per cent less than in 1934. A slightly larger acreage was planted in these states this season, but because of freezes and lack of rainfall yields are turning out very low. In the second section of the early group (Alabama, Georgia, Louisiana, Mississippi, South Carolina, Texas other, and California) the planted acreage has been reduced, but April 1 condition indicates that yields may be slightly higher than in 1934. Excluding California, the production in these states probably will be about 14 per cent smaller than last season. The planted acreage in the second-early states (North Carolina, Tennessee, Arkansas, and Oklahoma) is about 14 per cent smaller than in 1934, but this decrease in acreage probably will be partly offset by higher yields in North Carolina, where the major portion of the acreage in this group is located. On this basis, the early states as a whole have prospects of a crop about 13 per cent smaller than that produced last year.

Potato prices, old stock, at New York City averaged 96 cents per 100 pounds on an l. c. l. basis in the first week of April, compared with 83 cents the last week of March, 92 cents the first week of March, and \$2.16 a year ago. On March 10 they averaged about \$1.15 per 100 pounds, indicating that prices are still rising in the eastern markets. At Chicago, car-lot prices averaged 80 cents per 100 pounds in the first

week of April, compared with 67 cents in the third week of March, 73 cents the first week of March, and \$1.69 in the first week of April, 1934. Prices of new potatoes in New York rose steadily during March and the early part of April, or from \$3.11 per 100 pounds l. c. l. to \$4.33. At Chicago they advanced from \$3.62 to \$4.40 per 100 pounds by the first week of April.

The recent rise in central market prices was reflected in shipping-point prices, with the sharpest gains occurring at eastern and far-western points. Green Mountains at Presque Isle, Maine, advanced from 30 cents per 100 pounds f. o. b. on March 26 to 72 cents on April 9. A month ago they averaged about 34 cents. At Rochester and other western New York points, round whites advanced from 38 cents per 100 pounds f. o. b. on March 26 to 57 cents on April 6. Present prices are about 10 cents above those of a month ago. At Waupaca, Wisconsin, there was little change in the level of round-white prices during March, but there was a slight rise by the first week of April to 58 cents per 100 pounds. At Idaho Falls, Russet Burbanks advanced sharply from 70 cents sacked per 100 pounds, f. o. b. cash track, in early March to \$1.38 by the early part of April.

New potatoes at south Florida points advanced from \$2.50 per 100 pounds the first part of March to \$3.35 at the end of the month, when the season in that section closed. At Hastings, in northern Florida, Spaulding Rose potatoes were quoted at \$3.62 per 100 pounds during the first week of April.

Shipments of old stock potatoes from the late states this season to April 6 totaled 134,000 cars, compared with 139,000 cars to April 7, 1934. Since January 1, however, the movement has totaled 65,000 cars, or about the same as during last season, indicating that the weekly rate of marketings has been about equal to that during the first quarter of 1934. On the other hand, shipments of new stock from the Southern States this season to April 6 amounted to only 1,434 cars compared with 2,256 cars by the same time last year. Recently the movement has averaged slightly more than 100 cars per week, which is only about one-fifth of the output of new potatoes during the same period last year.

United States farm price of potatoes averaged 43.6 cents per bushel on March 15, as against 45.2 cents on February 15, about 92 cents on March 15, 1934, and 67.5 cents the March average for 1910-1914.

SECTIONAL NOTES

ARKANSAS

Potato growers in Arkansas are expecting a better price for their commercial crop than was in prospect at planting time. This improved outlook is largely due to the reduced plantings made throughout this section. Latest crop reports indicate that the states in our shipping season have reduced their plantings 14 per cent from that of last year. The reduction as first reported was only 7 per cent. Recent reports from growers indicate considerable seed rotting in the fields with poor stands developing as a result. The Arkansas River Valley area had some damage from excessive rains. Floods in the eastern end of the State will not have much effect on commercial production. Part of the reduction in acreage is due to the late date that money for planting was made available. The Production Credit Associations were late making credit available. Emergency feed and seed loans are just starting. (April 10).—WILLIAM G. AMSTEIN.

COLORADO

Potato prospects for this year are rather uncertain, due to a continuation of last year's drought. The Greeley district is worse off than any district in the state, having had sub-normal precipitation for two years, and there is no snow on the watershed to insure irrigation water this summer. The moisture supply in the San Luis Valley is about 80 per cent normal, and the conditions on the western slope are about the same.

A great many growers are unable to finance the purchase of seed because of crop failures last year, and those who have seed are afraid to plant too large an acreage because of the doubtful supply of water for irrigation. There will undoubtedly be a material decrease in the acreage planted this year. (April 12).—C. H. METZGER.

INDIANA

It is rather difficult to say what the acreage will be this year although I believe it will show an increase all over the state, not only in commercial plantings, but in the small farm patches as well. It looks as if we might have a production of between 6½ and 7 million bushels. (April 12).—W. B. WARD.

IOWA

The Iowa State Vegetable Growers' Association met at Mason City on March 21 and 22. The chief topics for discussion were the prevention of wind damage, cultural methods, the price situation and the potato control act. Iowa farmers, in general, have supported the agricultural adjustment program and it is likely that the vegetable growers would give similar support to any government program for the betterment of potato prices. They agree, however, that the final remedy is not by these artificial means, but by government ownership of surplus land, allowing them complete individual freedom and initiative in production.

The present spring has been a most difficult one for those who stored table stock potatoes or who sought to buy seed potatoes. There was a short crop of seed potatoes in the Red River valley because of drought. There is great need for seed potatoes in the southwest, because home-grown supplies are scarce and of poor quality. The Red River valley people thought they could base their prices on their own shortage of seed and they held on that basis until well along in February, when the surplus stocks of table potatoes from Wisconsin to Maine forced the sale of table stock to the West. This broke all prices, including, at last, those in the Red River Valley. A shortage of supplies in the Red River valley has developed and prices are increasing. Certified early Ohios are bringing \$2.00 per hundred at centers in Iowa, and certified Irish Cobblers \$1.75 per hundred.

Those who stored table stock received less for it this spring than they could have received last fall. Those who stored first crop seed grown from superior far northern certified seed are hoping that the increased prices of Red River valley stock will let them out. (April 8).—C. L. FITCH.

CALIFORNIA

With rare exceptions, there were very few potatoes above the ground on April 1st. Everything that had been planted early was cut back to the ground by a series of frosts during the month of March. The Shafter District which in the past two years has started producing potatoes during April and shipping large quantities of carloads in May was seriously affected. The set-back due to frost will delay the shipments from this section at least 30 or 40 days. It is very unlikely that carlot movements will start until the last week in May. Frost no doubt will have considerable bearing on the total yields as well as dig-

ging of immature potatoes on account of the lessened quantity of potatoes ordinarily produced in May.

The Colma District, adjacent to San Francisco, had some very adverse growing conditions. Considerable acreage was damaged on account of seed rotting, due to excessive rains and this added to a curtailment of acreage, lessened the total quantity to come from this area.

Planting in the Delta Region of the San Joaquin started on April 1st, which was about the normal time, but it is too early yet to give any information relative to this district.

California will need a great many more old potatoes in April and May this year than they used in the past and will draw heavily on the supplies that exist in Oregon, Washington and Idaho. The supplies in these states are smaller than they have been during the last two years and the general situation is; less old potatoes than enough to go around, new potatoes materially delayed and the quantity considerably lessened. (April 8).—H. G. ZUCKERMAN.

MAINE

Potatoes in Maine have shown considerable strength the first two weeks in April, more than believed possible the earlier part of the season. To date, Maine has shipped about 44,700 cars, an increase of approximately 5,500 over shipments to the same time a year ago. This total exceeds the shipments for the previous three years, and very nearly approximates the shipments of the season 1930-1931.

For the last two years, Maine has shipped 10,000 cars after this date. Close observers feel that 10,000 cars will absorb all the crop available for shipment on the basis of present prices of approximately seventy cents per hundred-weight. With higher prices it is quite apparent that shipments would increase. The distribution has not widened out as has been anticipated. There are some indications to show that this will shortly take place, which should have a decidedly beneficial effect on prices.

The trade generally does not realize the tremendous quantities of potatoes that have been ground up for starch and potato flour, and also the unusually heavy amounts fed to livestock. As nearly as can be checked, approximately 5000 cars have been ground up in the starch factories to date and an additional 1000 cars have been consumed locally. The amount of potatoes kept at home, and either fed or ground up, probably exceeds that of any year in Maine's history.

The seed situation is very interesting. Shipments, to April 13, total 3,612 cars of which 2,009 are Cobblers, an increase of 350 cars

over last year. In addition, 588 cars of Green Mountains were shipped this season, which is an increase of about 150 cars over a year ago. Maine has thus enjoyed one of the best seed deals in history. What effect that is going to have on the season of 1935 and 1936 is yet to be determined.

The indications, at least, are that the possibility of substantial reduction in acreage is very slim indeed. No concerted effort is being made to reduce acreage by a definite amount. Farmers are very reluctant to plan their program, as yet. The majority have not yet ordered their fertilizer, nor made credit arrangements. There is so much confusion and uncertainty that nothing definite can be determined until the planting season is over. There will, apparently, be credit available even though restricted in the amount per acre, to plant nearly the same acreage in Maine. Ample fertilizer supplies will be on hand for the last minute rush. We are now looking forward to a mad scramble during the next six weeks.

The maintenance of the potato acreage in all surplus producing areas seems quite similar to the present mad race in world armaments. Each section, and each country, is afraid to make the first move. How long this condition can continue, can be determined only by future developments.

In the meantime, we hope that Maine can benefit through some one else's disaster, just as every other State is doing. (April 13).—FRANK W. HUSSEY.

An act to assure proper branding of potatoes has been introduced in the Legislature in the State of Maine by Representative Findlen. The act provides for the establishment of grades and branding and is made mandatory. For years it has been the hope of agricultural leaders in the state that such an act would be adopted but there seems to have developed a better sentiment for such a move than in any previous session of the Legislature. The sum of \$10,000 is annually appropriated for carrying out the purposes of the act. Certified seed with the blue tag will be exempt, but seconds and other grades from certified seed will have to conform with the law.

A hearing was also held on a bill to appropriate \$50,000 to advertise Maine farm products which, for the most part, means potatoes. To sum up the potato situation here in Maine; our people favor a National Potato Act. We are, however, proceeding on the theory that we might not get such an act and that better grading, coupled with proper branding, will give us something upon which we can spend money for advertising and get results. In other words, from now

on Maine will sell the consumer what he wants and not attempt to make him take what we put up.

Distribution of certified seed has been about as usual; 23 states having received some cars. Increased business in Indiana, Illinois and Kentucky is noticeable. A recent letter from the trade indicates that the use of bags with all sorts of labels is causing confusion. Pennsylvania reports a car with South American markings on coffee bags. It will probably be necessary to discuss the use of new bags with our shippers.

The department has hired four extra inspectors this year to handle the work and expects that this increased force will be a large factor in getting a better product to market. There has been about the usual number of inquiries for foundation stock, but there is no indication yet as to acreage of certified seed for 1935. (April 15).—E. L. NEW-DICK.

MASSACHUSETTS

Planting has begun in the earlier section of the State. Less favorable weather conditions the past two weeks have delayed somewhat early plantings at first indicated by the fine weather in March. Farmers seem to be planning for about the same acreage as last year. (April 12).—RALPH W. DONALDSON.

MICHIGAN

It is a little early to report early potato acreage since very few are able to plant before April 20. The season is early, however, and planting will be done perhaps a week earlier than was possible last season. Indications point to a slight increase in the Irish Cobbler acreage in the southern part of the state, particularly near Detroit. This variety is practically the sole early variety now grown in Michigan. The Early Ohio was of some importance in the East-central part of the State a few years ago, but has been displaced by the Irish Cobbler.

Certified Irish Cobbler seed is being cleaned up very satisfactorily, considering the rather large crop produced last fall. The certified Russet Rurals are moving rather slowly as yet, but growers usually expect little activity in the movement of this variety before May. About 220,000 bushels of Russet Rurals were certified to sell.

The 5000 bushels of certified Katahdins grown last season in Michi-

gan sold readily and were purchased largely by Michigan growers. In all, practically 25,000 bushels of Katahdins will be planted in Michigan for table stock and certification this year.

The total certified acreage has been fairly constant during the last four or five years and is expected to remain so for 1935, with a possibility of a slight increase. (April 13).—J. J. BIRD.

NEBRASKA

Our reports indicate that the potato crop in Nebraska will be two per cent short of the acreage harvested last year. However, as large or even larger acreage may reasonably be anticipated in the western irrigated area where last year a uniformly good price was received for Triumphs.

To date, in the North Platte Valley, no agreement has been reached between the growers and processors of sugar beets. Failure to reach such an agreement will obviously result in a large acreage of Triumphs in this area. Moreover, present prospects for irrigation water favor the planting of potatoes rather than sugar beets.

A meeting of potato growers was held at Scottsbluff on March 22. Various speakers from this area, from the University of Nebraska and from Colorado, discussed storage and cultural problems in growing potatoes. (April 9).—LIONEL HARRIS.

There is every indication of a heavy planting of early potatoes in the regions of the state where these are grown. Much of this increase is on the part of people who have never grown potatoes before or if so on a very limited scale. There is an effort on the part of many of these people to produce a crop which will have more cash value. Another interesting development is the fact that Irish Cobbler potatoes from Maine are being planted 200 miles west of the Missouri River.

It is early to say very much about the late crop or the certified seed potato crop. At the present time the acreage to be devoted to sugar beets is still uncertain, due to the perennial difficulty of agreeing upon a price. If a satisfactory price is not arrived at in a short time there is likely to be a distinct increase in the acreage of potatoes in the western irrigated sections. Here, however, as in the dry land regions, great increases in acreage are not likely to occur because of the shortage of seed stock. There has been a considerable amount of snowfall and rain in the western counties where our late potatoes are grown. This has raised the hopes of the people and has, for the time being at least,

eliminated some of the troubles which they have been having with dust storms. If the land is properly handled this recently acquired moisture should guarantee satisfactory growing conditions for the potato crop until several weeks after planting time.

The unusual feature of meetings held at Alliance and Scottsbluff was the discussion of the proposed Federal potato legislation. Judging from the opinions expressed at these meetings and outside the meetings, very few potato growers are especially enthusiastic about this legislation. However, most of them seem to feel that such legislation is probably necessary or inevitable in order to protect the potato grower from the disastrous consequences which may result if farmers who have signed wheat and corn contracts continue to go into potato production as a means of increasing their cash income. Most of them seem to think that the purposes of the bill are very commendable but that the perishable nature of the crop and the great variety of conditions which cause such extreme fluctuations in yield, etc., render the administration of the bill extremely difficult. At both meetings the general plan of the proposed legislation was approved and committees were appointed to confer with the proper authorities concerning changes which are deemed essential and to keep in touch with the legislation as it proceeds. (April 8).—H. O. WERNER.

NEW JERSEY

Planting is well under way in New Jersey and would have been largely completed last week except for the fact that the weather made this impossible. The acreage would appear to be approximately the same as last year. Nearly all the acreage was planted with certified seed and an appreciable amount of the seed was disinfected in one of the organic mercuries before planting. The New Jersey growers have found that this practice materially reduces the injury from brown stem due to rhizoctonia. For most part, a 4-8-7 or 4-9-7 fertilizer mixture was used although a considerable number of growers used an 8-16-14 mixture. Careful attention was given to the location of the fertilizer, since extensive tests have demonstrated that better stands and more uniform growth in the early season follow applications two inches to the side of the seed piece. (April 15).—WM. H. MARTIN.

NEW YORK

The federal report of intentions to plant indicates that the New York potato acreage of 1935 will be about 3.8 per cent below 1934 and

2.4 per cent below the three year average for 1932-1934. In our opinion, these figures are not very significant and we do not anticipate very much, if any, reduction in plantings this year. The table stock market in the Western New York area (Rochester reports) has ranged from 8 to 15 cents a bushel, farm price, for several weeks. Although this might be expected to discourage planting the usual acreage, the net result will more likely be a normal or an increased acreage. A poor market makes cheap seed and much of the stock in storage which cannot be fed will be planted. The New York Cooperative Seed Potato Association reports that most of the Cobbler, Mountain and Russet Rural seed has already been sold and that the market for the remaining White Rural seed is expected to be satisfactory. The long-time outlook for potatoes in New York is good and most of the progressive growers know this.

We understand that the Warren Potato Act of 1935, designed to control the volume of potatoes marketed, is not likely to pass. Several of our farm bureaus conducted a letter poll of growers to determine the sentiment for and against this proposed legislation. Although the sentiment seems to be fairly equally divided, the majority vote was antagonistic. Long Island growers were particularly strong in their opposition. (April 13).—E. V. HARDENBURG.

Five hundred and sixty-five ballots were mailed to Suffolk County potato growers to determine their reaction to the proposed National Potato Control Act. Of the one hundred and seventy-four growers who returned ballots, 19 growers representing 1066 acres, were in favor; 153 growers representing 7361 acres were opposed, and 2 were neutral. Under the general heading of remarks, 65 favored acreage control, 23 no government control and 10 thought that Long Island should be regarded as a separate unit.

Potato planting started the week of March 18. Most growers will have finished by April 20th, provided rainy weather does not interfere. Almost no planting was done the week of April 8 on account of rainy weather. (April 11).—W. G. BEEN.

SOUTH CAROLINA

The potato crop is in very good condition at this time and growers report that they have an excellent stand. Potatoes were planted during a very short period in early February and weather conditions have been favorable since then. With continued favorable weather condi-

tions, we should have good yields this year and with the season for other vegetable crops being some ten days to two weeks earlier than last year, we are expecting carlot shipments from South Carolina to get under way about May 10. (April 12).—GEORGE E. PRINCE.

TENNESSEE

The biggest change in the Irish potato situation has resulted from almost continuous rains since March 1. Any who did not have potatoes planted before that date have found it very difficult to make any plantings since then. (April 8).—BROOKS D. DRAIN.

RHODE ISLAND

Planting will not start for another 10 days in the principal growing areas. The weather has been cold and unseasonal, so planting may be a little later than usual. Prospects are for about the same acreage as last year. All of last year's crop has been sold. (April 12).—T. E. ODLAND.

VERMONT

Vermont growers appear to be strongly in favor of the principle of the Warren bill, provided a satisfactory allotment basis can be worked out. They do not favor it if individual allotments must be based strictly on verifiable sales evidence, for no one could furnish sufficient documentary evidence to secure the allotment which should really be his.

At five meetings held at the more important potato sections of the state last month, the bill was fully discussed by Dr. D. R. Miller of the Extension Service, the writer, representing the State Department of Agriculture, and at several, by L. H. Marvin, President of the Vermont Certified Seed Potato Growers' Association. The meetings were open to all growers and were well advertised. Two votes were taken at each meeting. The vote was 2 to 1 against the bill in its present form. There was, however, a 4 to 1 vote in favor of the bill if the plan for individual allotments could be satisfactorily worked out.

Approximately half the certified Green Mountain crop in Vermont and nearly all the certified Irish Cobblers had been moved to date. (April 10).—HAROLD L. BAILEY.

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RESEARCH AND THE POTATO INDUSTRY

Years of low prices are not new to the potato growers. In the past they have been accepted as inevitable and the growers hoped for better fortune another year.

The progressive grower went further than this. He realized that production costs must be lowered if he were to continue growing the crop. With this realization he petitioned the Agricultural Experiment Stations for assistance in the solution of his many problems. Seed potatoes were frequently badly diseased and off-type. Foliage and tuber diseases, even when clean seed was planted, made serious inroads on profits. Information was likewise needed on the kind and amount of fertilizer to use as well as the best method of application.

These and other problems were investigated by Experiment Station workers and a solution found for them. These findings were soon adopted by efficient growers and as a consequence they produced potatoes at a lower cost per bushel. With the lower production costs they were in a much better position to meet the low prices of certain years.

The present situation of the potato grower cannot be improved by inactivity. We must continue our research program. Much remains to be accomplished. We need additional information concerning the nature and control of the many virous diseases of the potato. There are, also, still many unsolved problems concerning the control of other diseases attacking the tuber. We are in need of better varieties and many points in connection with the culture of the crop should be investigated. It is particularly important that additional information be obtained of the relation of the soil to the development of the crop. The solution of these problems is much to be desired since this will lead to more efficient production. We must remember that, regardless of what else we may do, the efficient grower is most likely to succeed. The potato growers are entitled to, and must have, a continuance of research activities. Without the benefits of research, the interests of the potato growers are certain to suffer.